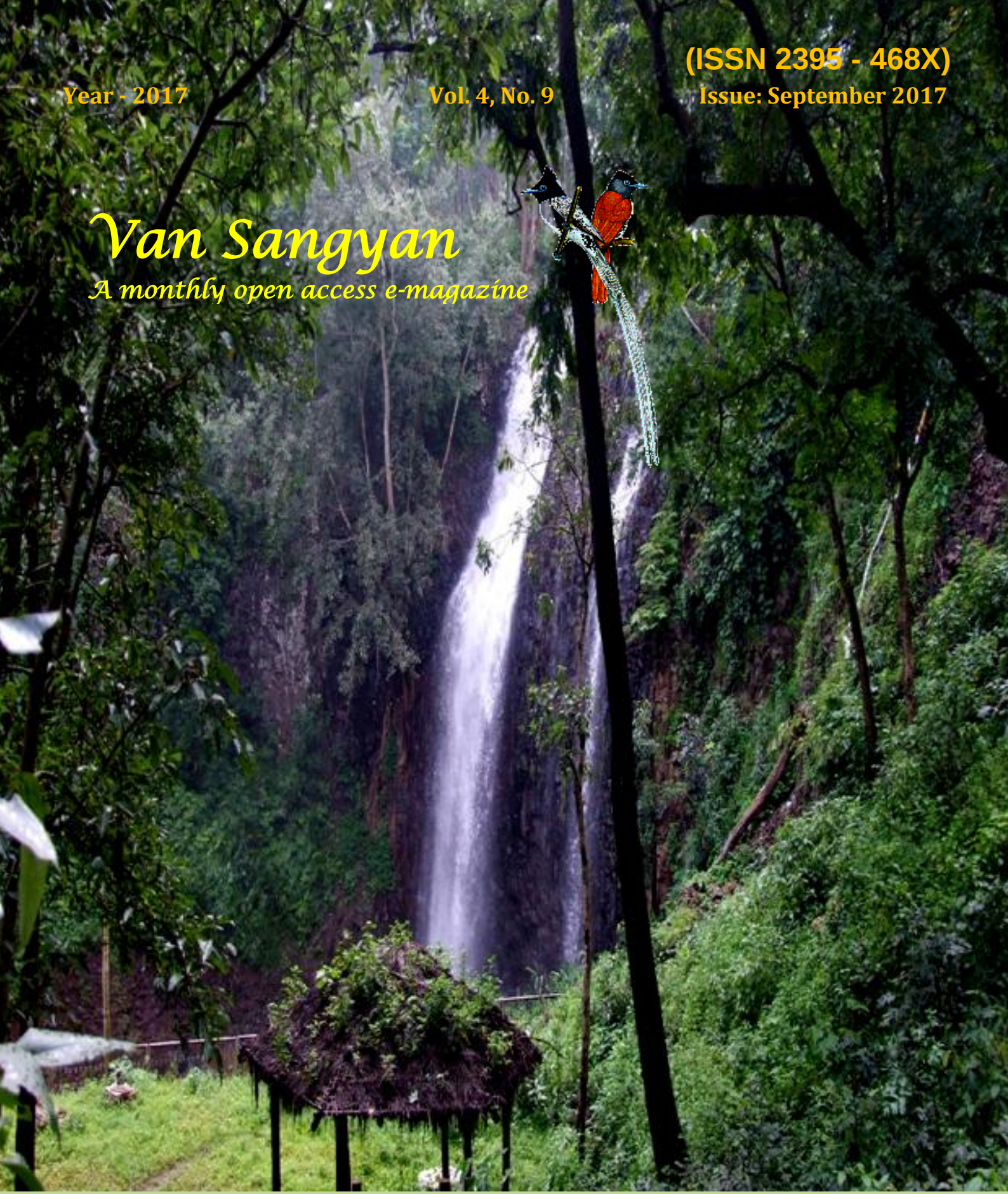
(ISSN 2395 - 468X)
Year - 2017 Vol. 4, No. 9 Issue: September 2017

Van Sangyan

A monthly open access e-magazine



Indexed in:

COSMOS Foundation (Germany)

International Inst. of Org. Res. (Australia)

Tropical Forest Research Institute
(Indian Council of Forestry Research and Education)
Ministry of Environment, Forests and Climate Change (MoEFCC)
PO RFRC, Mandla Road, Jabalpur – 482021. India

Van Sangyan

Editorial Board

Note to Authors:

We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

by e-mail to vansangyan_tfri@icfre.org, vansangyan@gmail.com

or, through post to The Editor, Van Sangyan,
Tropical Forest Research Institute,
PO-RFRC, Mandla Road,
Jabalpur (M.P.) - 482021.

The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number.

TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

Cover Photo: Panoramic view of Achanakmar-Amarkantak Biosphere Reserve
Photo credit: Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

From the Editor's desk

Macro fungi refers to all fungi that produce visible fruiting bodies. Macro fungi are an important component of Kingdom Fungi, and they play significant roles in natural ecosystems. Many of these fungi act both as key decomposers and as food sources for animals. Most macrofungi produce fleshy and colloidal fruiting bodies representing sexual reproductive structures; however, some visible structures, such as sclerotia, represent the asexual reproductive stage. Most macrofungi belong to Basidiomycota or Ascomycota while a few are Zygomycota. Their fruiting bodies may be located above- or below ground. There is a large number of macrofungi in the world. Out of the approximately 100,000 described fungal species, an estimated 6000 can produce visible fruiting bodies and sclerotia.

Macro fungi may live saprophytic, parasitic, and/or symbiotic lifestyles. Many of them, especially the symbiotic ones such as the majority of ectomycorrhizae, cannot reproduce independently. Instead, their host partners are needed to help them disperse and reproduce. These fungi are evolutionarily and ecologically very divergent. Evolutionarily, they belong to two main phyla, Ascomycota and Basidiomycota, and many of them have relatives that cannot form visible fruiting bodies. Ecologically, macro fungi can be associated with dead organic matter, plants, and animals. Fungi are among the most important organisms in the world, because of their vital role in ecosystem functions, influence on humans and human-related activities. Although fungi are extremely diverse, they are often ephemeral and cryptic, rendering inventorization difficult . The ranges of some tropical species may not be as restricted as they appear because of the lack of adequate surveys. However, knowledge of biodiversity at the community and species level is essential to monitor the effectiveness of, or the need for reservation, and also to follow the effects of natural or artificial disturbance. The data on fungal diversity and distribution are limited and fragmentary, the consensus is that certain patterns are robust and are worthy of further consideration. The objective of this study was to evaluate the species richness and density of macro fungi by quantitative analysis of species occurring in this man-made forest of the Coastal Tamil Nadu, southern India.

Fungi hold key roles in nutrient dynamics, soil health,species mutualisms and interactions, and overall ecosystem. However, despite their functional importance, they are often overlooked and left out of conservation initiatives processes. The influence of the replacement of a native forest by mono and multi-species plantations on fungal diversity has been studied in several countries. Some studies have shown that coniferous plantations can display significant fungal diversity, however other studies have shown that exotic conifer plantations display a fungal diversity lower than those of native hardwood stands. In New Zealand, replacing Nothofagus forests with Pinus radiata reduced the species richness and diversity of indigenous ectomycorrhizal fungi. In a French temperate forest stand, replacement of the native beech-oak forest with Norway spruce, Douglas-fir, Nordmann fir and Corsican pine also reduced the diversity of epigeous ectomycorrhizal and saprotrophic fungi.

This issue of Van Sangyan contains an article on Diversity of macro fungi in central India-VII: Polyporus grammocephalus. There are also useful articles viz. Acorus calamus, Chloroxylonswietenia – A potential multipurpose agroforestry tree, Lesser-looked aspects of wood, वनों में आग लगने के कारण व सुरक्षा के उपाय (in Hindi), Impact of sunlight (ultraviolet radiation) on wood, Documentation of Strychnos nux-vomica in Bhitarkanika National Park, Odisha and Biodiversity of Vitex negundo and Pitta brachura.

I hope that readers would find all information in this issue relevant and valuable. Van Sangyan welcomes articles, views and queries on various issues in the field of forest science.

Looking forward to meet you all through forthcoming issues.

Dr. N. Roychoudhury
Scientist G & Chief Editor

Contents

Diversity of macro-fungi in central India-VII: *Polyporus grammocephalus*

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Polyporus grammocephalus is common in India where it normally occur on dead hardwood causing white rot and occasionally growing as a parasite on living trees (De and Roy, 1981). The fungus is reported to be distributed in Philippines, New Zealand, Cuba, New Guinea and Brazil (De and Roy, 1981). This fungus has novel capacity to produced laccase enzyme (Huang et al., 2011).

In the present article diversity of host range of *Polyporus grammocephalus* in central India, taxonomic description, artificial cultivation and nutrient composition in sporophores are discussed.

Materials and methods

Collection of samples

Samples of *Polyporus grammocephalus* were collected from central India (Chhattisgarh, Madhya Pradesh, Maharashtra and Odisha) and specimens were deposited in the mycology herbarium of Forest Pathology Division, Tropical Forest Research Institute, Jabalpur, India as per details presented in Table 1.

Identification of fungus

Identification of fungal fruiting bodies has done with the help of relevant literature (Acton and Sandler, 2001; Mohanan, 2011; Sterry and Hughes, 2009; Tiwari et al., 2013; Verma et al., 2008; Young and Smith K, 2005) and internet.

Results and discussion

***Polyporus grammocephalus* Berk (Fig. 1-6)**

(Polyporaceae, Polyporales, Agaricomycetidae, Basidiomycetes, Basidiomycota) = *Favolus grammocephalus* (Berk.) Imazeki

=*Favolus spathulatus* (Jungh.) Lév., *Annls Sci. Nat.*, Bot., sér. 2: 203 (1844)

=*Hymenogramme spathulata* (Jungh.) Sacc. & Cub., *Syll. fung.* (Abellini) 5: 653 (1887) =*Leucoporus grammocephalus* (Berk.) Pat., *Philipp. J. Sci.* 10: 89 (1915)

=*Polyporellus grammocephalus* (Berk.) P. Karst., *Meddn Soc. Fauna Flora fenn.* 5: 38 (1889) =*Polyporus grammocephalus var. emerici* (Berk. ex Cooke) Cooke, (1885) =*Polyporus spathulatus* (Jungh.) Corner, *Beih. Nova Hedwigia* 78: 67 (1984) =*Royoporus spathulatus* (Jungh.) A.B. De, *Mycotaxon* 60: 145 (1996)

=*Trametes emerici* (Berk. ex Cooke) Ryvarden, *Syll. fung.* (Abellini) 9: 195 (1891) =*Trametes varia* Lloyd, *Mycol. Writ.* 7: 1114 (1922) =*Tyromyces grammocephalus* (Berk.) G. Cunn., *Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 164: 135 (1965)

Taxonomic description

Fruit body annual, solitary or imbricate, pipeate, dimediate, stipitate or resupinate if pileate pileus up to 60 x 25 x 5mm (up to 7.0cm wide) laterally attached with a stipe like contracted base upper surface white when fresh, ochraceous or brown when dry, smooth, entire, pore surface straw coloured, dimidiate, sessile, consistency tough and flexible. Pileus, adpressed tomentose, ochraceous to tan or pale

brown with numerous fine radial lines becoming more toughed towards the base, margin thin and deflexed in dried specimen. No KOH reaction. Hymenium, straw colour, tan to pale brown in old specimen, pores thin walled and round to angular, 3-4/mm, poretube upto 1-3 mm thick. Context, cream to ochraceous, homogenous, 2-4 mm thick. Hyphal system, dimitic, generative hyphae hyaline, thin walled with clamp, branched, 2.5-3.0µm wide, binding hyphae bovista type, abundantly present, thick walled to solid, 3.5-4.5µm wide. Basidia: clavate, 19-22.0 x 5.0-6.5µm. Basidiospore, cylindrical, ellipsoid guttulate, thin walled, hyaline and smooth, 8.0-12.0 x 4.0-4.5 µm. The fungus is causing white fibrous rot in stem below bark (Fig. 1-6).

Table 1: Host range and distribution of *Polyporus grammocephalus* in Chhattishgarh, Madhya Pradesh and Odisha

S. No.	TF No.	Name of host plant	Place of collection	Date of collection
1	518	*Anthocephalus indicus*	Jabalpur, MP	28.8.2006
2	831	*Tectona grandis*	TFRI campus, Jabalpur, MP	24.8.2007
3	995	*Butea monosperma*	Kalpi, Jogimandi	25.9.1989, 30.1.1990 04.4.1990
4	1098	*Bauhinia* twig	-	-
5	1279	*Ougeinia oojeineusis*	Rasaiyadona	10.12.2008
6	1454	*Boswellia serrata*	Risala	18.08.2009
7	1641	*Cleistathus collinus*	Nagree, CG	21.8.2008
8	1581	*Ougeinia oojeineusis*	Katghora, CG	19.8.2008
9	1820	*Diospyros melanoxylon*	Gariabandh, CG	1.10.2008
10	2052	*Mangifera indica*	Muapali, Odisha	18.8.2009
11	2054	*Shorea robusta*	Bamra, Odisha	18.8.2009
12	2278	*Pterocarpus marsupium*	Kantabanji, Odisha	25.8.2009
13	2288	*Tectona grandis*	Kantabanji, Odisha	25.8.2009
14	2552	*Shorea robusta*	Khopriya (cuttack), Odisha	15.9.2009
15	2893	*Madhuca latifolia*	Nagree, CG	15.9.2010
16	2910	*Ficus glomerata*	Dharam pani, CG	27.7.2011
17	3123	*Butea monosperma*	Atariya, Bilaspur, CG	17.7.2011
18	3262	*Zizipus jujube*	Kota, CG	26.12.2009
19	3263	*Bauhinia varigata*	Harrathode, Ambikapur, CG	07.02.2010
20	3392	*Boswellia serrata*	Tureekala, Odisha	23.9.2012
21	3447	Wood	TFRI campus, Jabalpur, MP	19.07.2013
22	3935	*Ziziphus jujeba*	TFRI campus, Jabalpur, MP	07.07.2017
23	-	*Nerium odorum*	Saliwada, Gour, Jabalpur, MP	25.06.2017

Artificial cultivation

For production of laccase enzyme it was cultivated in malt extract agar and corn grit broth agar was used as alternative medium. The spawn was produced on four granulated materials (cracked corn, rice seeds, sorghum seeds, and rye seeds) used as substrate. The highest yield and biological efficiency of fruiting body was recorded in substrate formulation containing 6 parts of rice straw + 4 parts of sawdust (Milton et al., 2017). *Polyporus grammocephalus* is a wild edible mushroom throughout the tropics. Few species of the genus were also reported to exhibit antioxidant and antitumor activities, but one or two report has been found for *Polyporus grammocephalus* (Roy, 2010). Spawn preparation is an important step in cultivation of mushroom. In different substrate, pearl millet grains supported best growth, followed by wheat and sorghum. This is due to good water holding capacity of grains and also availability of enough surface cover area for mycelia growth. In the case of pearl millet spawn, the grains acted as a carrier for evenly distributing the mycelium and also served as nutritional supplement. Therefore, it resulted in fast and uniform mycelial growth. Although sorghum was also equally supporting spawn run. Corn, saw dust and finger millet supported very least respectively. Less growth was due to less water holding capacity in corn or the little surface cover area for mycelial growth in finger millet. The spawn mycelium produced different colours in different substrates. In saw dust, brilliant brown or pale brown was observed. The colour of the mycelium in both the substrate was similar because colour formation was not influenced by the grains (Kumar and Kumar, 2017).

Nutrient composition of *Polyporus grammocephalus*

The powdered fruit body is light yellow with a pleasant aromatic smell and characteristic taste. Protein, an important component of dry matter of mushrooms contains all the exogenous amino acid; however the level of some of them is insufficient. The protein content was found to be 20.6±0.25g/100g of dry tissue. The soluble and total carbohydrate content as estimated by Dinitrosalicyclic acid (DNSa) method were 18.73±1.02g, 41.11±0.57g/100g of the dry tissue, respectively. The crude fibre content of the sample was 24.62 ± 1.65 g / 100 g of dry tissue. Fiber is now considered to be an important ingredient in a balance and health diet (Chang and Miles, 1989). The free amino acid content of the fungus as quantified by procedure of Sadasivam and Manickam (1996) was 8.75 ± 0.53 g / 100g of dry fruit body. The content of the fats in this mushroom is low which ranges from 1.1-8.3% on dry weight basis with an average of 4.0% (Chang and Miles, 1989). The moisture content was estimated 89.1% of the fresh materials. The fruit bodies of mushrooms are characterized by a high level of well assimilability mineral constituents (Vetter, 1994; Demirbas, 2001; Falandysz et al., 2001; Mattila et al., 2001). The mineral contents were: calcium 40mg/ 100g dry weight, potassium 1550 mg/ 100g dry weight, magnesium 120mg/ 100g dry weight, phosphorous 1150mg/ 100g dry weight and iron 15mg/ 100g dry weight. Analysis of proximate composition of *Polyporus grammocephalus* revealed that this mushroom is rich in protein and carbohydrate, moderate in crude fibre, ash and low in fat content. This mushroom is a good source of essential amino acids and minerals. Phosphorus and potassium are

the two dominant elements in mineral portions. Considering all these values this mushroom is a low caloric, crude fiber rich which can be used as a safe diet for suffers of several killer diseases. The crude, boiled and ethanolic extracts of *P. grammocephalus* showed significant inhibition lipid per-oxidation activity. *P. grammocephalus* possessed significant antioxidant activity thus suggested the therapeutic value of this mushroom. Due to very low amount of fat it can be used as a diet for suffers of high blood pressure, atherosclerosis, etc. With high fiber content the mushroom possess the ability to revitalize immunity and can increase the life span of persons consuming them (Saini and Atri, 1999; shodhganga.inflibnet.ac.in/jspui/.../07_chapter%202.pdf).

Acknowledgement

Authors are thankful to Dr. N. Roychoudhury, Director, Tropical Forest Research Institute, Jabalpur for providing necessary facilities and Indian Council of Forestry Research & Education, Dehradun for financial assistance under project ID No. 224/TFRI/2016/Patho-1(22).

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Fig. 1. *Polyporus grammocephalus* on *Ziziphus jujuba*, habit and close view of fruit body

Fig. 2. *Polyporus grammocephalus* on *Ziziphus jujube*, sporophore dorsal and pore surface

Fig. 3. *Polyporus grammocephalus* fruit body on *Nerium odorum*

Fig. 4. *Polyporus grammocephalus* causing white rot in wood of *Ziziphus jujuba*,

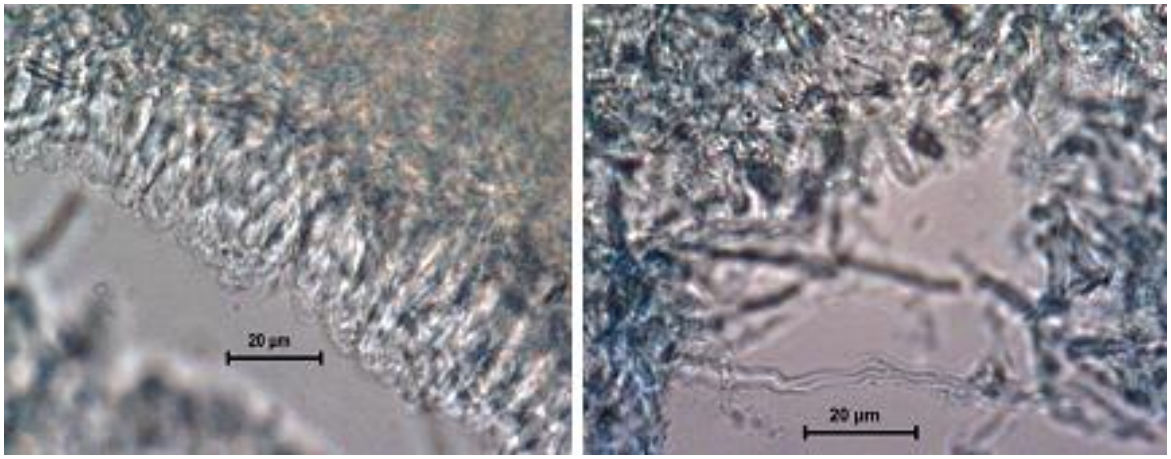

Fig. 5. *Polyporus grammocephalus*, cross section showing basidial layer and hyphal system

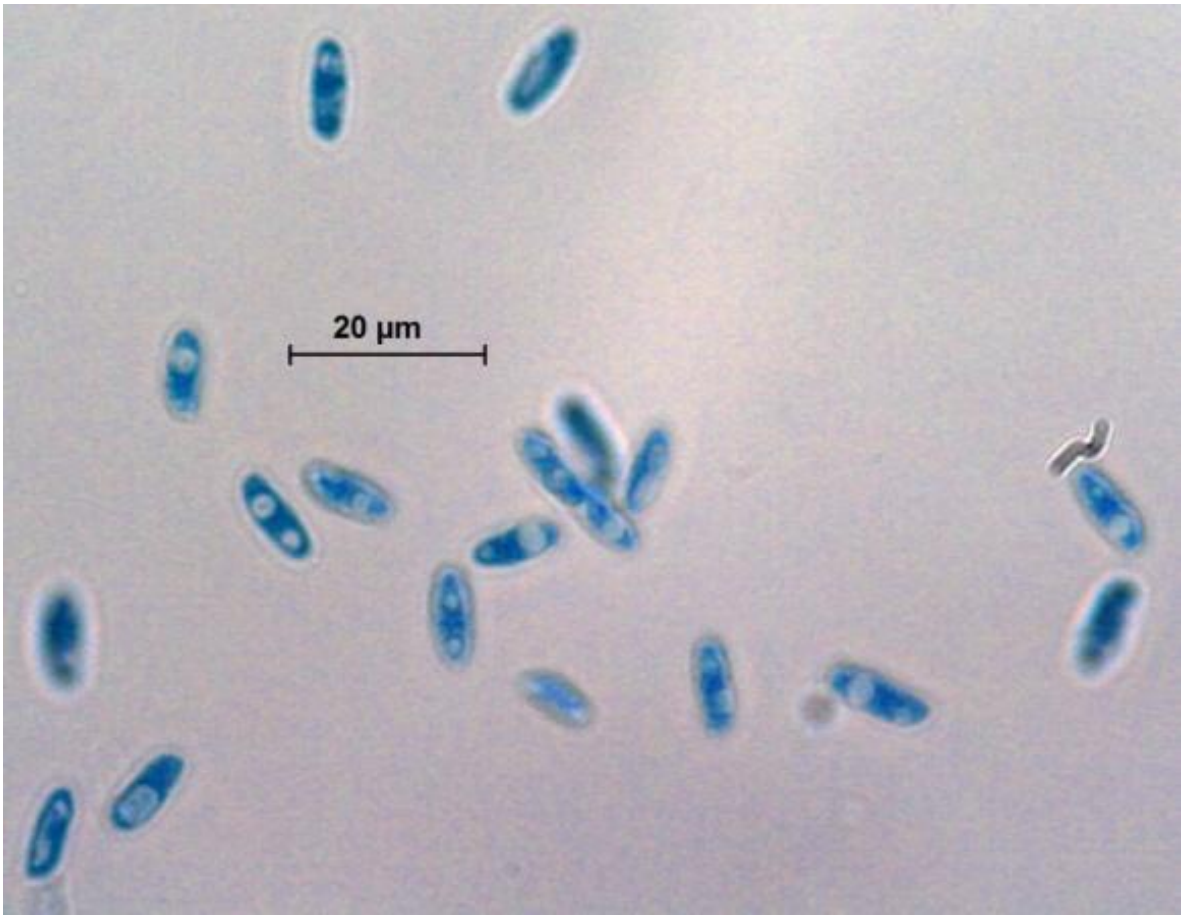

Fig. 6. *Polyporus grammocephalus*, basidiospores

Acorus calamus

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Introduction

Ayurvedic system of medicine describes a number of plants for their medicinal uses. Acharya Charak has quoted well that "Where there is an illness, there is a treatment". Nature is full of valuable medicinal plants. It gives an immense pleasure while sharing my knowledge and experience about the forest and ethno medicinal wealth of our country.

Acorus columns is one of the most important medicinal plants from the basket of forest wealth. It has tremendous medicinal values. Which can be drawn out from all parts of this plant. In terms of botany it belongs to Acoraceae family.

Taxonomic description: -

Kingdom	-	Plantae
Sub Kingdom (Vascular Plant)	-Tracheobionta	
Super Division (Seed Plants)	-Spermatophyta	
Division (Flowering Plant)	-Magnoliophyta	
Class (Monocotyledons)	-	Lilliopsida
Sub-Class	-	Arecidae
Order	-	Aracaseae
Family	-	Aracaseae
Genus	-	Acorus L.
Species	-	Columus

Syn: Acorus griffitthi shott, A. Belongeii shott, A. cassia Bertol.

English Name – The Sweet Flag, Sweet Sedge, Myrtle, Flag.

Bot Name – Acorus columns Linn

Common name- Ekhand, Vasa buch, veshambh, veshambhu, Vasa, vekhand etc.

Habitat and distribution

Acorus columns is a perennial monocot plant which grows in wetlands. It showas the origin from Ireland and its adjacent countries. A group of basal leaves evolve outside from the underground rhizome of this plant. A. columns leaves are found to be long, and sharpens at the tip, pale-green in color, usually cattles dislike these leaves.

Acorus calamus plant is found in almost all parts of India, Central Asia, Russia and Siberia. The medicinal properties of this

plant allowed it to spread across Eastern Europe and North-America. In India this plants grows beside the lakes, on the banks of rivers wetlands of ponds and other wastelands.

Cultural importance

According to Greek mythology A. Calamus plant is considered to be the symbol of Love and Romance. Walt Whiteman, in one of his poems "Calamus" has written that A. Calamus is a symbol of love, romance, attraction and sensitive captivation of young teenage love.

In Tamilnadu people make the bracelets from the roots of these plants, which are tied on infant baby's hands for at least six month, which is considered to protect infant from bad or evil powers.

History

Acorus calamus plant has a long history of usage in native and non –native folk medicinally and ritually by Algonquians, Cree and other NE-tribes. A. calamus, a sterile triploid, was introduced to India and North America by early European settlers, who grew it for medicinal uses. Rhizomes propagate easily and the species has spread throughout India and North-East and central United States.

Phyto-chemicals of *A. calamus*

Many of the scientists have been analyzed the phytochemicals found in rhizomes of A. calamus. Phytochemicals are basically the secondary metabolites present in the cells of any of the parts of plants. These phyto-chemicals may be of various values i.e. medicinally, economically and commercially. The oil extracted from the rhizomes of this plant contain α-arasone, β – arasone, C- arasone, Calamine, X-pinine, B-pinine, eugenine acetate, euginol, iso-euginol, methyl iso- euginol, X-caryophyline and some hydrocarbons, These all volatile phytochemicals can be extracted by using steam distillation method.

Medicinal Properties

Acorus calamus plant has a number of

traditional medicinal values. Despite safety concerns calamus is used for gastro-intestinal problems including ulcers, inflammation of gases (Flatulence), upset stomach, and loss of appetite (Anorexia). Calamus herb is very popular for its curative powers towards many diseases, like epilepsy, constipation, rheumatic swellings; B-arasone present in its rhizome contains antibacterial properties.

Acorus calamus is slightly tonic but forms a useful adjunct to other tonics and stimulants. It is very popular for the remedies of cough and cold and also the other respiratory disorders like bronchitis. In raw form it is also useful as a cough lozenge. The rhizome of A. calamus plant is given to children who stammer for a very long time. This problem can be solved by chewing calamus chewing calamus rhizome for at least four weeks.

Chewing calamus rhizome clears the voice as well.

Conclusion

From the above description we can conclude that Acorus calamus plant has many of the medicinal values. About these medicinal values common people are still unaware. In India only the tribal people have a good enough knowledge about its pharmacological importance. Acorus calamus is a gifted wealth of nature which should be utilized by common man for medicinal uses. Scientists are still trying to find out more medicinal values of this plant. We must share the knowledge and importance this plant with the persons who are needy.

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Chloroxylon swietenia – A potential multipurpose agroforestry tree

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Abstract

Chloroxylon swietenia is one of the multipurpose agroforestry trees, which is grown in and around the farmlands of south India. It can be integrates with agricultural crops like gourds and cash crops like turmeric. These leaves, barks and roots are widely used in Indian system of medicine. The wood is known for its highest strength, so used in the heavy construction, railway sleepers, boat buildings and agricultural equipment.

Introduction

Present-day agriculture is facing several challenges such as technological, resources and capital constraints. To overcome these challenges tree based farming (Agroforestry) is one of the viable option in where judicious integration of forest trees with agricultural crops and livestock. It is also one of the main alternative sources for food, fuel, raw materials to the industries and other forest products in present-day India (NRCAF, 2013). Hence, it helps in improve the sustainable livelihood of famer and alleviation of poverty. Indian tropical agriculture facing serious issues like frequent droughts, floods and cyclones. In order to farmers are growing trees in and around the farmlands. *Chloroxylonswietenia* is one ofmultipurpose agroforestry tree widely cultivated by farmers of south India for fuel wood, timber and medicinal values.It is cited under IUCN Red List Category as*vulnerable* due to ruthless extraction of timber from natural forests. Hence there is an urgent need to conservation and a sustainable utilisation of these trees.

***Chloroxylon swietenia* - Botanical description**

Chloroxylon swietenia DC belongs to the family *Rutaceae* which is popularly known as East Indian satinwood or Ceylon satinwood or Purasu. It is mainly occurs in dry deciduous forests and native to India, Sri Lanka and Madagascar. It is a medium-sized deciduous tree with a height of 9-10 m and girth of 1.0 -1.2m (Jayaprasad *et al.*, 2009). Barks are fissured, thick, corky and light yellow coloured spongy in nature. Alternate, paripinnate leaves in greyish or glaucous-green color. Gland-dotted, apexrounded, 2-2.5 mm of petiolule.Sub-opposite or alternate, oblong, obtuse, glabrous and glaucous of leaflets (10-20 pairs) arranged in rachis of 20-30 cm. Flowers are white or creamy colour and present in terminal or axillary panicles often clustered towards the ends of branches. Oblong or ovoid capsules are 2.5 – 4 cm long, 3-celled and 3-valved dehiscent. Falcate winged oblong seed (1.8-2 cm) are membranous in nature. It is cited under IUCN Red List Category as*vulnerable* due to ruthless extraction of timber from natural forests.

Medicinal use

Leaves, barks and roots of *Chloroxylon swietenia* are widely used in traditional system of Indian medicine to cure the various diseases (Rao et al., 2009). A paste

of the leaves applied on the wound. It is also used to cure the cold, cough, snakebites, ophthalmic infectionsand rheumatism. The leaves decoctions are used as lotion to treat the ulcer and skin abrasions (CSIR, 1992). Since the crushed leaves and roots are applied on forehead as a balm to cure headache. Smoke from burning leaves used to keep away the ticks. The bark of *Chloroxylon swietenia* is considered as astringent and used to cure the fever, contusion, chest pain and painful joints.

Bio pesticides

Nowadays pesticides are widely used in agricultural fields which most of them are synthetic chemical origin. It produces numerous amount of damage to environment lead to toxicity and disease to humankinds. Nowadays crops pests also develop resistance towards such chemicals. Hence naturally originated pesticides have potential to control the growth of pest population. *Chloroxylon swietenia*has the potential of killing and controlling the growth of pests like Cotton worm (*Spodoptera littoralis*), cotton bollworm (*Helicoverpaarmigera*) and Redflour beetles (*Triboliumca staneum*) (Kiran et al., 2007; Harwansh et al., 2009). Also volatile substance like pregeijerene, geijerene and germacrene are active against mosquito like *Aedesaegypti Anopheles stephensi* and *Culexquinque fasciatus* (Kiranand Devi, 2004; Kiran et al., 2006).

Timber

The wood of *Chloroxylon swietenia*is often range from golden yellow to orangish brown in colour with natural luster. Smooth textured interlocked grainslook mottles or ripples resemblinglike satin fabric. The wood is known for its strength, hence widely utilised for heavy construction, railway sleepers, boat buildings and agricultural equipment. Also it can be used as decorative timber in crates, furniture, joineries, panels, floorings, carvings, trims, toys and musical instruments (Jayaprasad*et al.*, 2014). It is highly resistant to termite and fungal attack.

In agroforestry

Even though *Chloroxylon swietenia* is slow growing in nature, this can planted in field boundaries. Barks of satinwood tree facilitates the fast climbing of agricultural gourds like bottle gourd (*Lagenaria siceraria*), snake gourd (*Trichosanthescu cumerina*), ridge gourd (*Luffaacutangula*), bitter gourd (*Momordica charantia*) and beans (*Lablab purpureus*). The white coloured flowers of this tree, attracts the large amount of honey bees to the field. Also it produces the bitter taste honey while foraging this flowers. This trees can be incorporated with cash crops like turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), Cocoa (*Theobroma cocoa*) and other crops like groundnut (*Arachishypogagea*), small onion (*Allium ceiba*), gingelly (*Sesamum indicum*)Hence it has deep roots, it won`t competes with other agricultural crops. This leaves has easily decomposable by nature.

Conclusion

Therefore, *Chloroxylon swietenia* has tremendous potential in agroforestry. Also there is need to standardize intensive cultivation practices.

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Lesser-looked aspects of wood

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Present day building construction in India mainly depends upon bricks, cement, sand, and steel. This was not the case some hundred years back. Apart from the above components, wood forms a major component. There aremuch old buildings to display the utility of wood. Apart from the building components, wood was used for making some artefacts that are now antiquity. Many of such significant artefacts are now fully protected and conserved. Wooden artefacts are very much prevalent in western countries, whichare conserved and preserved very scientifically. These collections are atreasury of culture and heritage. There was an extensiveusage of wood in Indian architecture, temples, and royal courts. This has created a rich cultural treasure, whichneed to be safeguarded. Preservation and conservation efforts are done. This article brings in the perspectives and aspects that are considered while doing the preservation.

The profound usage of wood is justified by the continuous supply: after a tree is felled another tree can grows in its place. It is not a surprise that the people would have used specific wood for specific purposes. For instance, the hardwoods are known for the durability but softwoods have the lusture and design (Hunt, 2012). This indicates that the people were conscious in choosing the type of wood.

Wood – focus on properties

Wood, the secondary xylem has certain properties tend it suitable for specific end purpose. The mechanical properties of wood make it us a unique material. The ability of wood to undergo or withstand tension and compression stresswhich the stone and concrete lacks. The lightweight nature of the wood is preferred for certain constructions. Eventhough there were difficulties in theusage of wood. It was a choice even for painting(Łukomski, 2012). As stated earlier, people were conscious in choosing the type of wood depending on the enduse.

End uses

In Indian context with 3000 timber species, the list of end use will be voluminous. Listing the end uses and suitable species, whichis listedby Mehta (1981).The wood used for making different products. For instance, Buildings: Bricks are the apt material for construction of thebuilding but certain places brick or stone cannot use for construction. Especially, the areas where there is aneed for flexibility as well as strength. Similarly, wooden poles, furniture, sculpture, and carving, painted panels are all made of wood. These wooden structure are susceptible to damage and degradation. Especially, wooden sculpture and carvings are vulnerable to biological degradation. The added consideration should be for the large solid sculptures in which the dimensional movements cause cracks. Cracking is unavoidable at theoutdoor condition. Therefore, application of paint will only delay the onset of cracking, and the cracks will then allow the ingress of water. In such cases, a water repellent is more effective, by encouraging the fast

drainage of rain and so hindering biological degradation.

The conservation of ancient timbers from the sea is probably themost difficult and complex of all conservation work. This is a much-specializedsubject, more details found in Grattan, and Clarke (1987). Therefore, there are many areas for awood scientist has to work along with other experts. This will ultimately make wood science to anew face.

Works on these lines

Very recent works published in the current science journal will a good example. Sujith*et al*. (2017) made successful restoration of an artefact in Kerala. It was anas old statue made up of *Artocarpus heterophyllus* wood. The team consisted of wood scientist and archaeologists. The wood scientist was able to identify the wood. This helped the team to select the appropriate methodology to restore the statue. In this case, they have used neem gum and cashew nut shell liquid extract. There are the various other methodologies that can beusedfor the restoration of artefacts. There is a good work on Unger et al. (2001). This can be agood reference for the budding as aspirants in awood scientist, especially in the conservation and restoration of artefacts.

Steps in future

The journal of cultural heritage has brought out a special supplement issue, titled as 'wood science for conservation'. The journal addresses the concepts such as examining wooden cultural heritage objects, different timber structures, thematter pertaining to painted wood and waterlogged wood (Uzielli, and Gril, 2012). There is four papers those details on the wooden musical instruments that are treasured for it antique properties. Finally, the editors bring on the latest development of techniques used for the treatment and retreatment of wooden objects.

In this background, one has to look to the vast number wooden antiques in the country. There are few significant wood works such as the Padmanabhapuram palace in Kerala, Chowta palace in Mangalore and many more.

Pillar sculptures in Chowta palace

Conclusion

This brought my focus on the rich cultural heritage of India where wood is used in several incidents or places. Therefore, there is aneed for the Indian wood scientist to bring out the developments made in this aspect of research that they carry out. Need for the multidisciplinary research approach highlights the uniqueness of this area. For instance, the work of Sujith*et al*. (2017) was due to thecollaboration of researchers from adifferent background.

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वनों में आग लगने के कारण व सुरक्षा के उपाय

ममता पुरोहित, राजेश कुमार मिश्रा एवं नितिन कुलकर्णी

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पूरे विश्व में वनों में आग लगना एक सामान्य घटना है । प्रतिवर्ष वनों में लगने वाली आग से वनों, वन्य जीव-जन्तुओं, पारिस्थितिक तंत्र और पर्यावरण को बहुत नुकसान होता है । वृक्षों को होनेवाला नुकसान वृक्षों की प्रजाति, आयु और ऋतु पर निर्भर करता है । ग्रीष्म ऋतु की आग ठंड के मौसम में लगने वाली आग से अधिक हानिकारक होती है । अन्य वनों की अपेक्षा शंकुधारी वनों को आग से अधिक हानि पहुँचती है । वनों में आग प्राकृतिक और मानव गतिविधियों के कारण लगती है परन्तु दोनों ही कारणों से लाखों एकड़ का वन क्षेत्र प्रभावित हो जाता है । जहाँ वनों से लघु वन उपज एकत्रित करने वाले आदिवासियों और ग्रामीणों को आर्थिक नुकसान होता है वहीं इमारती लकड़ी से राज्य सरकार को मिलने वाला राजस्व भी प्रभावित होता है । प्राकृतिक कारणों से लगी आग की तुलना में 95% आग की घटनाओं का संबंध मानव समुदाय से रहता है । मानव अपनी सोच और व्यवहार में सुधार लाकर वनों को आग से होनेवाले नुकसान को कम कर सकता है ।

वनों में आग लगने के प्राकृतिक कारण

- बिजली (बादलों में निर्मित होनेवाली विद्युत) बिजली वनों में आग लगने का आम कारण है तथा वनों की सूखी दशा इस आग को फैलाने में मदद करती है ।
- गिर रही चट्टानों की आपसी रगड़ से उत्पन्न आग वनों में आग लगा देती है ।
- सूखे पेड़-पौधे जैसे बांस ।
- अत्यधिक सूखे एवं गरम पदार्थों का स्वाभाविक संयोग ।
- ज्वालामुखी की सक्रियता सक्सेशन के क्रम व पारिस्थितिक तंत्र के विकास को प्रभावित करती है तथा इडेफिक वातावरण को बहुत ज्यादा परिवर्तित कर देती है । यदि ज्वालामुखी की सक्रियता नियमित अन्तराल पर होती है तो मृदा नियत अवधि पर राख से समृद्ध हो जाती है ।

मानव गतिविधियों से वनों में आग लगने वाले मुख्य कारण

जान बूझकर आग लगाना

ग्रामीणों में अक्सर यह गलत धारणा होती है कि जंगल में आग लगाने से घांस जल्दी आती है । इसी तरह जड़ी-बूटियों को एकत्रित करने के लिए भी जान बूझकर आग लगाई जाती है ।

अचानक आग लगना

वनों में से जाती हुई रेल गाड़ियों के इंजन से निकली चिन्गारियों से आग लगना तथा कई बार फायर लाइन को साफ करने के उद्देश्य से लगायी गयी आग जंगल में फैल जाती है।

लापरवाही के कारण आग लगना

कई बार वनों में लगे कैम्प में भोजन आदि के लिए जलाई गई आग को कार्य समाप्त हो जाने के बाद ठीक तरह से नहीं बुझाने पर ये हवा आदि से फैल जाती है। इसी प्रकार जलती हुई सिग़रेट, बीड़ी को बिना बुझाये जंगल में फेंक देने से आग लग जाती है।

वनों में लगने वाली आग के प्रकार

वनों में लगने वाली आग तीन प्रकार की होती है-

धाराग्नि (ग्राउन्ड फायर)

इस प्रकार की आग वनों में प्रायः उन स्थानों पर लगती है जहाँ बहुत अधिक मात्रा में लिटर का जमाव रहता है। यह आग लम्बे समय तक लगी रहती है और जंगल में फैलती रहती है। इस आग से जंगल में पड़ा कूड़ा-करकट, घांस, ह्युमस और भूमि की ऊपरी सतह के साथ साथ छोटे-छोटे पौधे भी जल जाते हैं परन्तु कुछ काष्ठीय झाड़ियाँ और वृक्ष मोटी एवं सुरक्षात्मक छाल और भूमि में गहराई तक गई जड़ों के कारण जीवित रह जाते हैं। इस आग में लपटें नहीं निकलती तथ धुआँ भी बहुत कम होता है परन्तु यह अधिक हानिकारक होती है।

तलाग्नि (सरफेस फायर)

जब आग सूखे पत्तों, घांस, वृक्ष के निचले भाग, छोटे-छोटे पौधों, पुनरुत्पादित पौधों, पेड़-पौधों के जमीन के अन्दर के भागों से निकले अंकुरों और सतह के लिटर को जलाती है तो इसे तलाग्नि

कहते हैं। यह झाड़ियों, वृक्षों और सतह की मिट्टी को भी झुलसा देती है। इस आग से लपटें निकलती हैं परन्तु यह कम हानिकारक होती है।

छत्राग्नि (क्राउन फायर)

यह आग वनों को जलाती है तथा केवल छत्र ऊँचाई पर ही चलती है। यह एक वृक्ष के वितान (केनॉपी) से दूसरे वृक्ष के वितान (केनॉपी) में फैलती है। छत्राग्नि प्रायः शंकुधारी वनों में ही लगती है।

पेड़-पौधों में आग के विरुद्ध पाये जाने वाले अनुकूलन

1. आग प्रतिरोधक छाल और लम्बा तना धराग्नि और तलाग्नि से होनेवाले नुकसान से बचाने में मदद करते हैं जैसे- पाइनस, लारिक्स व क्वेरकस में।
2. बार-बार आग लगने वाले क्षेत्रों के बहुत से वृक्षों में तने के निचले भाग तथा जमीन के अंदर जड़ों पर सुसुप्त कलियाँ पाई जाती हैं जो आग के बुझ जाने पर नई शाखायें उत्पन्न करती हैं जैसे आस्ट्रेलिया में यूकेलिप्टस वृक्षों में।

3. यूरोप और आस्ट्रेलिया में पाई जाने वाली बहुत सी झाड़ियों के विशेष भागों पर सुसुप्त कलियाँ पाई जाती हैं जिन्हें लिग्नोट्यूबर कहते हैं। ये लिग्नोट्यूबर जमीन के ऊपर पूरे पौधे के जल जाने पर नई शाखायें उत्पन्न करते हैं।
4. कुछ पेड़-पौधों में मोटी पत्तियाँ पाई जाती हैं जिनमें पानी अधिक मात्रा में तथा राल और तेल बहुत ही कम मात्रा में पाये जाते हैं।
5. वनों में आग लगने के दौरान बीजों का कठोर बीज कवच प्रभावकारी ढंग से मृदा के ताप से भ्रूण की रक्षा करता है।

आग सूचक वनस्पति

इपीलोबियम अनगस्टीफोलियम (Epilobium angustifolium) एक अग्निसूचक प्रजाति है। यह

सामान्यतः छोटे-छोटे पैचों में सुषुप्तावस्था में रहती है परन्तु जब वनों में आग लगती है तो यह क्रियाशील होकर तेजी से वृद्धि कर पूरा पौधा बन जाती है जबकि अन्य पौधे आग से नष्ट हो जाते हैं।

वनों में लगनेवाली आग से हानियाँ

1. आग से बहुत सारे बीज नष्ट हो जाते हैं जिससे पौधों का प्राकृतिक उत्पादन नहीं हो पाता है।
2. छोटे-छोटे पौधे जलकर नष्ट हो जाते हैं।
3. बार-बार आग लगने से वन की उत्पादन क्षमता पर हानिकारक प्रभाव पड़ता है।
4. आग से वृक्षों में खुले घाव बन जाते हैं जिन पर हानिकारक जीवाणुओं का आक्रमण आसानी से हो जाता है।
5. बार-बार आग लगने से वनस्पतियाँ खत्म हो जाती हैं फलस्वरुप वनस्पति रहित भूमि में सूर्य व वायु के प्रकोप के कारण भूमि का कटाव शुरु हो जाता है।
6. कार्बनिक पदार्थों के जल जाने से बड़ी राख की मात्रा, छाया की कमी तथा वर्षा की बूंदों के भूमि में रुकने में आयी कमी के कारण सूक्ष्म जलवायु (माइक्रो क्लाइमेट) में बहुत अन्तर आ जाता है।
7. वोलेटाइलाइजेशन के कारण नाइट्रोजन का नुकसान होता है।
8. आग लगने के बाद मृदा में होनेवाले परिवर्तन के फलस्वरुप मृदा में पाई जाने वाली कवक प्रजातियाँ कम हो जाती हैं तथा बैक्टीरिया की सँख्या बढ़ जाती है।
9. आग मृदा के कार्बनिक पदार्थ, कुल पोषक तत्व, पी. एच. तथा पानी को रोके रखने की क्षमता को परिवर्तित कर देती है।

10. वन में रहनेवाले पक्षियों के अंडे एवं छोटे-छोटे पक्षी तथा पशुओं के छोटे-छोटे बच्चे आग से जलकर मर जाते हैं जिससे प्राकृतिक संतुलन बिगड़ जाता है तथा हानिकारक जीवों की सँख्या बढ़ जाती है ।
11. बार-बार आग लगने से सदाबहार वन नष्ट हो जाते हैं और उनकी जगह घांस के पेवन (पैच) या निम्नकोटि के पतझड़ी वन बन जाते हैं ।

वनों में लगनेवाली आग से लाभ

1. वनों में लगनेवाली आग से पाइनस वृक्ष के शंकुओं (कोन) को खुलने में मदद मिलती है जिससे बीज सुगमतापूर्वक शंकु से निकल आते हैं।
2. चराई वाले क्षेत्रों में लगी आग मवेशियों द्वारा पसंद किये जाने वाली नयी एवं कोमल शाखाओं व घांस को निकलने में मदद करती है।

नियंत्रित रूप से लगाई जानेवाली आग के लाभ

1. घांस, खरपतवार और बहुत सी अवांछनीय प्रजातियों के नष्ट हो जाने से उगने या उगाये जाने वाले पौधों के लिए वृद्धि हेतु प्रतिस्पर्धा खत्म हो जाती है।
2. कोनिफर वनों में आग से निडिल जल जाने के कारण बीजों के अंकुरण के लिए भूमि खाली हो जाती है।
3. रोपणी व पौध रोपण क्षेत्र की सफाई के साथ-साथ मृदा की उपजाऊ शक्ति बढ़ जाती है। कार्बनिक पदार्थों के जलने से बनी राख से मृदा को खनिज पदार्थ मिल जाते हैं।
4. ऐसे क्षेत्र जहाँ फॉरेस्ट्री ऑपरेशन के अन्तर्गत कटाई आदि का कार्य हुआ हो वहाँ बहुत अधिक मात्रा में पत्तियाँ, टहनियाँ, कूड़ा-करकट आदि इकट्ठा हो जाता है फलस्वरुप बीजों का भूमि से सम्पर्क न हो पाने के कारण पुनरुत्पादन नहीं हो पाता। अतः कूड़ा-करकट आदि जल जाने से पुनरुत्पादन में सहायता मिलती है।
5. भूमि का कटाव रोकने के लिए ढलानों पर सेक्करम बेन्घालेन्स (*Saccharum benghalense*) लगाया जाता है। ठंड के दिनों में छप्पर व रस्सी बनाने के लिए पत्तियों को तोड़ लिया जाता है तथा ठूंठ में आग लगा देते हैं जिससे ज्यादा अच्छी पत्तियाँ और बायोमास मिले, वर्षा की बूंदे मृदा में रुकें तथा भूमि का कटाव रुके।

वनों में लगी आग को बुझाने के उपाय

आग लगने से पहले सुरक्षा के उपाय

1. वनों से सूखी टहनियाँ, पत्तियाँ, घांस, सूखे ठूंठ एवं सूखे वृक्षों आदि को वनों से हटाकर नियंत्रित आग लगाकर फायर सीजन से पहले खत्म करने से आग लगने को काफी सीमा तक रोका जा सकता है।

2. आग बटिया (फायर लाइन) का मुख्य कार्य आग फैलने में बाधा पहुँचाना है । अतः आन्तरिक आग बटिया और बाह्य आग बटिया में किसी भी प्रकार की वनस्पति को बढ़ने नहीं देना चाहिए तथा हर समय साफ करते रहना चाहिए।

आग लग जाने पर उसे बुझाने के उपाय

1. आग लगने की सूचना अविलम्ब वन परिक्षेत्र अधिकारी या वन परिक्षेत्र कार्यालय को देना ।
2. आग बुझाने के यंत्रों तथा आग बुझाने वालों का आग वाले क्षेत्र में जल्दी से जल्दी पहुँचना ।
3. मिट्टी द्वारा आग बुझाना । यह आग लगनेवाली जगह पर आसानी से मिल जाती है ।

4. बढ़ती हुई धराग्नि व तलाग्नि को टहनियों द्वारा या पीटने वाले यन्त्रों द्वारा पीट-पीट कर आमतौर पर बुझाया जाता है ।
5. आग लगने की विपरीत दिशा में जानबूझ कर प्रत्याग्नि (काउन्टर फायर) लगायी जाती है । जब बढ़ते-बढ़ते दोनों आग मिल जाती है तो आग स्वयं बुझ जाती है । मैदानी क्षेत्रों में प्रत्याग्नि सड़क या आग बटिया (फायर लाइन) से शुरु की जाती है । ढलानदार क्षेत्रों में यह कार्य चोटी (रिज) से शुरु किया जाता है ।

आग बुझ जाने पर किये जाने वाले कार्यः

1. जल रहे लकड़ी के टुकड़ों, ठूंठ आदि को बुझा देना चाहिए ।
2. आग से जले क्षेत्र का नक्शा बनाना व नुकसान का आंकलन करना ।
3. पुनरुत्पादन के कार्य करना ।

आवश्यक सावधानियाँ

आग लगने की सूचना हेतु

1. वन विभाग द्वारा आग को देखने के लिए वाच टावर बनाना ।
2. फायर सीजन (मार्च से नवम्बर) के दौरान संवेदनशील क्षेत्रों में फायर वाचर नियुक्त करना ।
3. वायरलैस प्रणाली की उपलब्धता बढ़ाना।

ज़न जागरण

जन समुदाय की सहभागिता बढ़ाने के लिये

1. वन विभाग द्वारा समय-समय पर प्रचार-प्रसार अभियान द्वारा लोगों को जागरुक किया जाये कि वनों की आग से सुरक्षा करने में पूरा सहयोग दें क्योंकि वन पारिस्थितिक तंत्र के महत्वपूर्ण घटक हैं । वनों की रक्षा करना मानव एवं अन्य जीव समुदाय के हित में है ।

2. वन में पड़ी सूखी टहनियों, पत्तियों, घांस आदि को कब और कैसे जलाया जाए इसकी जानकारी दी जाए।

3. इश्तहार, समाचार पत्र, रेडियो, टेलीविजन, गोष्ठियों आदे के द्वारा आग से बचाव तथा होनेवाली हानियों के बारे में जागरुक करना।

Impact of sunlight (ultraviolet radiation) on wood

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Protecting wood surfaces in environment is a challenging task. There are numerous variables that contribute to erosion and degradation of the substrate including

sunlight, wind, moisture, salt, and sand. The two most destructive environmental variables to an exterior coating system and wood are sunlight and water. Sunlight is the major cause of damage to a number of materials, including plastics, textile, wood, coatings, and other organic materials. The type of damage, such as loss of gloss, chalking, elasticity, adhesion, and color change, varies depending on the material sensitivity and the spectrum of sunlight. Spectral sensitivity varies from material to material.

One component of sunlight is ultraviolet light, commonly referred to as UV. UV light is responsible for most damage to exposed wood because it changes or destroys the wood's lignin, a component of wood that hardens and strengthens the cell walls. In more scientific terms this process is called photo-oxidation. The colorants contained in the color coats are responsible for absorbing UV light. The more colorant a finish contains the less UV light will get through to the wood itself.

Opaque finishes like paint and solid body stains are very efficient in blocking all of UV light from hitting the wood. That's why when they peel off the freshly exposed wood may still look bright. On the other hand the objective of transparent stains is to allow the character of the wood to show through the finish.

In order to accomplish this transparency the pigment loading is significantly less than that contained in opaque finishes. Although some of the UV is blocked by the colorants, enough of it gets through to eventually photo-oxidize the wood. Since darker colors typically contain more colorant than lighter ones they tend to last longer. However, some lighter colors that contain titanium white, or KX colorant, also contain a high colorant loading which extends their life but they do give up some degree of transparency in return.

Lighter colored stains that contain titanium white (KX) will also absorb less heat; therefore, there will be less overall stress (day surface temperature versus night surface temperature) that the finish system and wood substrate is exposed to over the course of a 24 hour period.

Squared logs, timbers, and vertical flat siding are easier to maintain since the sun hits these wood pieces at the same angle and the UV light is evenly distributed over the entire surface. In addition, the flat vertical surfaces cannot accumulate snow and ice and even upward facing checks are not as prone to rainwater entering the logs. Squared wood pieces are subject to

the same weathering parameters as round surfaces, but the weathering is mostly uniform over the entire exposed surface.

The second challenging variable for wood in a coastal environment is moisture. Coastal areas are notorious for their high relative humidity and pop-up thunderstorms. Keeping wood dry is the goal to protecting its long term integrity. If wood remains wet for long periods of time without drying out, conditions are favorable for the formation of wood decay fungi, the precursor to wood rot. Four conditions are necessary for the development of wood decay producing fungi. Eliminate any one of these and decay fungi cannot survive: Oxygen, Temperature (40° - 90°F), Moisture content in excess of the fiber saturation point (> 25-30%), and a suitable source of energy and nutrients (i.e. the wood).

The Sun, the vital energy source of the Earth and human life, emits electromagnetic radiation which is classified by wavelength into radio, microwave, infrared, visible region, ultraviolet, X and gamma rays, most of which are invisible to human eyes. The visible region that we perceive as light is usually defined as having a wavelength between 400 and 700 nm. Ultraviolet (UV) radiation with a shorter wavelength than that of visible light can be divided into three regions, mainly according to the effects of radiation caused to human health and the environment (International Standard 21348 2007):

- UV-A radiation, wavelength 315-400 nm
- UV-B radiation, wavelength 280-315 nm
- UV-C radiation, wavelength 100-280 nm.

As sunlight passes through the atmosphere, all UV-C and most UV-B are absorbed by the ozone layer, whereas UV-A is not significantly filtered. UV-A accounts for approximately 95 % of the total UV radiation reaching the Earth's surface. UV-A is transmitted through a window glass.

UV-B is filtered by most window glasses. Because of its complete filtration by the atmosphere, UV-C is irrelevant in outdoor weathering (Klyosov, 2007).

The UV region, about 7 % of the total radiation, is the most energetic, and therefore the most damaging region of the spectrum of sunlight. The shorter the wavelength of UV radiation is, the higher is the energy of photons, and the greater the potential for harm. The wavelengths between 100 nm and 290 nm are the most destructive (Klyosov, 2007). UV radiation causes damages to the surface of a material or very close to the surface. UV exposure causes changes in the surface chemistry – also known as photodegradation – which may lead to discoloration of the surface and loss of mechanical properties (Andrady et al., 1998, Muasher and Sain, 2006).

The market is full of many types of coatings used for surface treatment of wood. The most commonly used are solvent-based lacquers, which provide high durability and abrasion resistance, being relatively easy to apply and quick drying. Unfortunately, while drying, solvent vapor occurring is harmful to the environment. Because of that environmental aspect, solvent based coatings are increasingly being replaced by water-based paints. Waterborne products are significantly less harmful to the environment and create coatings with

quality comparable to solvent-based ones (Jabłoński et al. 2009).

Coatings delay aging of wood, but are undergoing such proces themselves. (Iezzi, 1997; Schuetz et al., 1999). Much quicker degradation of paints is observed outdoors, where coatings are exposed to environmental factors, like sunlight UV radiation (Gerlock et al., 2000). In case of wood flooring coating system, aging does not occur evenly, because floor us usually only partially exposed to direct sunlight. Exposure is lower in covered places like under carpets or furniture, degradation is slower, and therefore discoloration of such unexposed places occurs slower

and color of exposed places may be significantly different than unexposed ones. (Thapliyal and Chandra, 1991; Wilhelm et al., 1998; Schaller and Rogez, 2008).

Exposure of wood to the weather results in rapid depolymerisation of lignin and cellulose, and degradation of the cellular structure of wood (Feist and Hon, 1984; Evans et al., 1996). These changes cause wood to yellow, as unsaturated photodegraded lignin fragments accumulate at exposed surfaces, and eventually become grey and rough due to leaching of photodegraded lignin and fibre fragments from the wood by rain (Feist and Hon 1984).

Surface degradation decreases the adhesion of coatings (Ashton, 1967; Williams and Feist, 1994) and encourages surface colonisation of weathered wood by the blackcoloured yeast Aureobasidium pullulans (de Bary) Arnaud (Schoeman and Dickinson, 1997). These apparent undesirable effects of weathering are confined to the wood surface. It is one of the definitions of weathering that it is a surface phenomenon and the limited penetration of sunlight with sufficient energy to degrade wood plays a pivotal role in this context. Water and heat, as other (less effective) factors of degradation, do not have the same penetration limits (Browne and Simonson, 1957). Beyond the zone immediately affected by light, the chemical and physical properties of weathered wood are believed to be largely unchanged (Horn et al., 1994). The intensity of light transmitted through wood decreases exponentially with depth, as predicted by the Beer-Lambert equation (Browne and Simonson, 1957).

Control measures

1. There are two basic ways to combat the effects of weathering. By far the most effective method is to keep wood surfaces in the shade as much as possible by extending roof overhangs or constructing roofed porches around the home.
2. Keep all vegetation at least 24 inches away from wood surfaces to allow for adequate ventilation and drying out of these surfaces.
3. Clean the wood surfaces to remove all foreign materials from the wood prior to the application of an exterior finish system. The overall performance of even the best finish system is dependent upon proper surface preparation and application technique.
4. Select and apply a highly durable exterior semi-transparent stain, like LIFELINE™ ULTRA-2 or ULTRA-7 to protect the wood and enjoy the beauty of the wood grain. Select LIFELINE™ ACCENTS to highlight wood

timbers and trim if more opacity is desired.

5. Select a color that contains shades of brown, red, or gray. Consider colors that contain titanium white (KX) for lower surface temperature swings as well as good UV protection.
6. Apply an exterior clear topcoat, like LIFELINE™ ADVANCE GLOSS or SATIN, to protect the color coat and add additional UV and mold and mildew protection. Consider the Gloss for additional reflection of UV light.
7. Fill all upward facing checks, cracks in wood, with a specialized acrylic sealant, like CHECK MATE 2™li>
8. Clean the finish systems at least once a year with LOG WASH™, a liquid concentrate for bare wood and maintenance cleaning, to remove all foreign debris for the surface of the finish system and extend the its longevity.
9. Perform an annual inspection of the coating system as a proactive maintenance approach.
    a. Darkening of the wood or finish when water is applied, an indication of water is getting through the coating and wetting the wood.
    b. Checks or micro-fissures in the wood, especially upward facing.
    c. Cracks in the finish.
    d. Color fading.
    e. Pay close attention to the south and west facing surfaces.
10. Keep metal surface clean and freshly painted. Salt spray is highly corrosive.

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Documentation of *Strychnos nux-vomica* in Bhitarkanika National Park, Odisha

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The present article reports the occurrence of strychnine tree, *Strychnos nux-vomica* L. (family Loganiaceae) in Bhitarkanika National Park, Rajnagar (Mangrove) Forest Division, Kendrapara, Odisha.

Fig. 1. Bhitarkanika island

Bhitarkanika is named as per two Odia words 'Bhitar' meaning interior and 'Kanika' meaning extraordinarily beautiful. In 1975, an area of 672 sq. km. was declared as Bhitarkanika Wildlife Sanctuary. An area of 145 sq. km, the core area of Bhitarkanika Wildlife Sanctuary was declared as Bhitharkanika National Park in 1998. It lies in the north eastern coast of Odisha in between $20^0$30' to $20^0$50' N latitude and $86^0$30' to $87^0$06' E longitude in Kendrapara district, Odisha.

Perusal of floral composition of Bhitarkanika National Park reveals the occurrence 73 plant species that includes true mangroves, mangrove associates, back mangroves and beach flora (http://bhitarkanika.org/live/Mangrove.asp?GL=mangrove&PL=1).According to Chadha and Kar (1999), Nayak (2004) and Anon (2015), there are 94 plant species found in mangrove forests of Bhitarkanika. Apart from these, nothing is known about the occurrence of flora in Bhitharkanika National Park. The present article is a new addition of plant species in Bhitharkanika National Park.

Recent survey conducted during November 2016 in mangrove forests of Bhitarkanika National Park, it was recorded that in Bhitarkanika island (Fig. 1), *Strychnos nux-vomica* L. (family Loganiaceae) is growing luxuriously with good regeneration (Figs. 2 and 3) (GPS coordinates, N $20^0$42'29.24", E $086^0$52'01.3", altitude 9841 m). This is a new record of flora found in mangroves of Bhitarkanika National Park. This is a promising species of potential importance.

Strychnos nux-vomica, the strychnine tree, also known as nux vomica, is a deciduous tree native to India, and south east Asia. It is a medium-sized tree in the family Loganiaceae that grows in open habitats. Its leaves are ovate and 2–3.5 inches (5.1–8.9 cm) in size.

It is found mostly in India and Malayan Archipelago. It is mostly found in semi-evergreen and moist deciduous forests of Maharashtra. It is also found in the foothills of Western Ghats. The plant grows well on

35-45 Celsius of maximum temperature and 4-18 Celsius of minimum temperature. It is also seen in South East Asia, Myanmar, Sri Lanka and Northern Australia. The plant grows well in dry, humid, late-rite, sandy and alluvial soil. It grows up to 50ft in height.

Fig. 2. *S. nux-vomica* tree in Bhitarkanika island

Fig.3. Germination of S. *nux-vomica* in Bhitarkanika island

Nux Vomica is a medium-sized tree with a short, crooked, thick trunk. The wood is white hard, close grained, durable. Branches are irregular, covered with a smooth ash-coloured bark. Young shoots are deep green, shiny. Oppositely arranged short stalked leaves are elliptic, shiny, smooth on both sides, about 4 inches long and 3 broad. Flowers are small, greenish-white, funnel shaped, borne in small clusters at the end of branches. They have a disagreeable smell. Fruit is about the size of a large apple with a smooth hard shell which when ripe is orange colored, filled with a soft white jelly-like pulp containing five seeds. The seeds are like flattened disks densely covered with closely apprised satiny hairs, radiating from the centre of the flattened sides and giving to the seeds a characteristic sheen.

Kuchala is a slow growing beautiful deciduous to semi evergreen tree growing commonly in shady areas. On an average it attains height of 10-12 m but grows even taller upto 2m if it gets a favourable condition. The bark is blackish grey to yellowish grey covered with minute tubercles. It has glossy oval leaves and frequently crooked trunk. Small greenish white flowers appear in terminal cymes. The fruits are small berry of a size of small orange, brownish yellow in colour contain a large amount of gelatinuous pulp in which 1 to 5 seeds are embeded. The seeds are disclike, 4-5 mm thick, irregularly curved and very bitter in taste.

S. nux-vomica contains the alkaloids, Strychnine and Brucine, also traces of strychnicine, and a glucoside Loganin, about 3 per cent fatty matter, caffeotannic acid and a

trace of copper. The pulp of the fruit contains about 5 per cent of loganin together with the alkaloid strychnicine.

It is used for digestive complaints such as indigestion, vomiting, cjiarxhoea, and constipation. It is given for over sensitivity and irritability.

S. nux-vomica is also good for colds with a blocked nose, flue with fever, shivering coughs with larynx pain. It is used for irregular menstruction, frequent urination, morning sickness and labour pain. Kuchla fruit is useful in treatement of leucoderma, blood disorders, piles, jaundice, urinary discharge and ulcers.

S. nux-vomica is recommended for upset stomach, vomiting, abdominal pain, constipation, intestinal irritation, hangovers, heartburn, insomnia, certain heart diseases, circulatory problems, eye diseases, depression, migraine headaches, nervous conditions, problems related to menopause, and respiratory diseases in the elderly. In folk medicine, it is used as a healing tonic and appetite stimulant. Nux vomica is a common homeopathic medicine prescribed for digestive problems, sensitivity to cold, and irritability. *S. nux-vomica*, commonly known as kuchla, contains strychnine and brucine as main constituents. Minor alkaloids present in the seeds are protostrychnine, vomicine, *n*-oxystrychnine, pseudostrychnine, isostrychnine, chlorogenic acid, and a glycoside. Seeds are used traditionally to treat diabetes, asthma, aphrodisiac and to improve appetite.

There are no uses in modern medicine, although it was widely used in medicine before World War II. Strychnine is a deadly poison with a lethal dose to humans of about 30 to 120 mg. Survival of substantially higher doses has been reported. The properties of *S. nux-vomica* are those of the alkaloid strychnine. The powder made from the strychnine seeds was used to alleviate indigestion. Mixtures of *S. nux-vomica* were also used as a stimulant on the gastro-intestinal tract. In the mouth it acts as a bitter dietary, increasing appetite by stimulating peristalsis. It was formerly combined with cascara and other laxatives to treat chronic constipation. Strychnine also increases the flow of gastric juice.] It is then rapidly absorbed as it reaches the intestines, after which it affects the central nervous system and the movements of respiratory system causing a quicker and deeper breathing motion. The heart is also slowed through excitation of the vagus center.The senses of smell, touch, hearing and vision are rendered more acute. It increases pulse and raises blood pressure and was once used as a tonic for the circulatory system in cardiac failure. Strychnine is eliminated with a half-life of about 12 hours.

The most direct symptom caused by strychnine is violent convulsions due to a simultaneous stimulation of the motor or sensory ganglia of the spinal cord. During the convulsions there is a rise in blood pressure. Brucine closely resembles strychnine in its action, but is slightly less poisonous as it only causes paralysis of the peripheral motor nerves. It is said that the convulsive action of strychnine is absent in brucine. It was used in pruritus and as a local anodyne in inflammations of the external ear. *S. nux-vomica* has shown to suppress allergen-specific IgE antibody response in mice, suggesting its possible application in allergic conditions. In vitro *S. nux-vomica* inhibited the growth of AGS human gastric carcinoma cells. Advocates of certain alternative medicine practices have suggested strychnos

for liver cancer, upset stomach, vomiting, abdominal pain, constipation, intestinal irritation, hangovers, heartburn, insomnia, certain heart diseases, circulatory problems, eye diseases, depression, migraine headaches, nervous conditions, problems related to menopause, and respiratory diseases in the elderly. In folk medicine it is used as an appetite stimulant. Strychnos is used in Chinese herbal medicine to unblock channels and reduce swelling. It is also used to alleviate pain and can treat abscesses and "yin-type" ulcers. In traditional Chinese treatment of cancer, it can be used in combination with other herbs.

In the Indian Unani system of medicine, "Hudar" is a mixture containing *S. nux-vomica* and used to elevate blood pressure. The seeds are first immersed in water for 5 days, in milk for 2 days followed by their boiling in milk.In India the quality/toxicity of traditional medical crude and processed STRYCHNOS seeds can be controlled by examining the toxic alkaloids using established HPLC methods and/or HPLC-UV methods. *S. nux-vomica* is also used in Homeopathy.

Acknowledgements

Authors are thankful to Shri Sidhant Das, IFS, the then Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, for permitting to carry out the field survey for documentation of flora in Bhitarkanika National Park and Shri Bimal Prasanna Acharya, OFS Group-A (SB), Divisional Forest Officer, Mangrove Forest Division (Wildlife), Rajnagar, Kendrapara, for field facility. Authors also extend their thanks to Dr. U. Prakasham, Director and Shri P. Subramaniam, the then Group Coordinator Research, Tropical Forest Research Institute, Jabalpur-482021 (M.P.) Special thanks are due to Shri Ram Bhajan Singh, Research Officer-II and Shri Asish Pandey, Field Assistant, Forest Entomology Division and Shri Bijay Kumar Das, Research Assistant, Mangrove Forest Division for field assistance.

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Know your biodiversity

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Vitex negundo

Vitex negundo commonly known as Indian Privet, Chinese chaste Tree, Horse shoe Vitex. It has numerous vernacular names like Nirgundi, Katri, Shimalu, Nagda, Banna etc. Indian Privet belongs to order Lamiales and family Lamiaceae. The plant is globally distributed throughout India, Malaysia, and Sri Lanka to Afghanistan, Madagascar, China and Philippines and cultivated in America, Europe, Asia and West Indies. In India it can reach to an altitudinal range up to 1500 m in the outer Himalayan region. The plant is abundant in open waste land areas and is widely planted as a hedge-plant along the roads and between the fields. Flowers of *Vitex negundo* are the smallest as compared to other commonly grown *Vitex* species.

Vitex negundo is a large shrub or sometimes looks like a small slender tree which usually attains height of 1-2 m. Bark is quite thin and grey in color. The Branchlets are quadrangular in shape, whitish in color with a fine tomentum. Leaves are 3-5 foliolate, opposite-decussate and petiolate. Leaflets are of two types- terminal leaflet and lateral leaflet. They are lanceolate, 5-10 cm long, 1.5 to 4 cm broad and acute. Petiole is 3-6 cm long. Calyx are 3 mm long, white, tomentose, teeth are also present and are triangular in shape, 0.8-1 mm long. Flowers are bluish purple in color, tomentose outside, hairy inside at the insertion of the stamens and opposite along the quadrangular rachis of a large terminal often compound pyramidical panicle. Corolla is 1 cm long and corolla tube is as long as calyx, limbs are slightly 2 lipped, with 5 unequal lobes. Stamens are 4 in number, didynamous. Ovary is glabrous. Drupes are less than 6 mm in diameter, subglobose or somewhat ovoid, 5 mm in diameter, usually 4-celled, with one seed in each cell, black or purple when ripe, rounded to egg shaped. Flowering season is from June- September. The plant seeds throughout the year.

The leaves, flower, seeds and roots of *Vitex negundo* are used to cure many ailments. It contains various chemicals such as alkaloids, tannins flavonoids and carbohydrates etc. It helps to control acne in teenagers, regulates ovulatory cycle, menopause, menorrhagia, menstrual difficulties, premenstrual syndrome, amenorrhea, endometriosis and fibrocyst breast diseases among women. It relieves pains due to rheumatism, gout and body ache resulted from heavy physical exertion, skin troubles and migraine. It has

a pungent, bitter, acrid taste, heating, astringent, stomachic, anthelminthic, promotes the growth of hair, useful in diseases of eyes, inflammations, leucoderma, enlargement of spleen, bronchitis, asthma, biliousness, painful teething of children. The plant is also mentioned in Ayurveda as useful in treating arthritic disorders. According to Ayurveda the root of *Vitex negundo* is an anti dote to snake venom. In case of the snake bite, the bruised roots bark and leaves are applied to the wounds. The juice of the fresh leaves is poured into the nostrils in stupor and coma, and is given internally.

The root is considered as tonic, febrifuge and expectorant. The leaves are aromatic, tonic and vermifuge. A decoction of Nirgundi leaves is given with the addition of long pepper in catarrhal fever with heaviness of head and dullness of hearing. A pillow stuffed with the leaves of Nirgundi is placed under the head for relief of headache. The juice of the leaves is said to have the property of removing foetid discharges and worms from ulcers. Oil prepared with the juice of the leaves is applied to sinuses and scrofulous sores. Leaves are used as mosquito repellent and and also useful in dispersing swellings of joints from acute rheumatism.

Vitex negundo has not yet been assessed for IUCN red list and population of this plant species seems to be stable, but the excessive use of these plants may lead to decline in its population. This plant is important not only for medicinal purpose but also can be used for afforestation, especially for reclamation of forestlands which are affected by floods, and in arid areas. Thus it is our sole responsibility to look after such important plant species which are benefitting us, our past generation and keep benefitting in future.

Pitta brachura

Pitta brachura is commonly known as Indian Pitta. It belongs to order Passeriformes and Family Pittidae. The bird is very colorful but they are shy in nature and usually seen hidden in undergrowths. The name *pitta* comes from Telgu word which means “small bird”. Other names of this bird in India are Naorang, Shumcha, Navranga, Polanki pitta etc. This bird has a habit of calling or chirping once or twice, often with neighboring individuals joining in, at the times of dawn or dusk which leads to their common name of “Six-O-Clock” bird in Tamil Nadu.

The birds are commonly seen in parts of Bangladesh, India, Nepal, Pakistan and Sri Lanka up to the altitudes of 1800 m. In India it is practically seen in all parts except the dry North-west portion. *Pitta brachura* is to a certain extent a migratory bird, which goes towards Peninsular India and Sri Lanka in winters and returning to the Northern provinces in the hot weather and rains, though some birds appear never to change their quarters. They breed mainly in the Himalayan foothill region, Pakistan in western side to Nepal and possibly up to Sikkim in the east. They

also breed in the hills of Central India and in the Western Ghats and South to Karnataka.

Voice of *Pitta brachura* is loud, lively whistle and very vocal during breeding time, also a longish single note whistle. It inhabits in scrub jungle, deciduous and dense evergreen forests. The birds can be seen in pairs or solitary and usually flies in small flocks at the time of migration, before and after monsoons. Indian Pitta shows fondness for shades, semi-damp areas.

Indian Pitta is beautiful multi-colored, stub-tailed, stoutly built bird which has numerous color combinations of bright blue, green, black, white, yellowish-brown and crimson. The bird attains the size approximately 18-20 cm and weighs around 47-66 g. It has long, strong legs, a very short tail and stout bill with a buff colored stripe, black coronal stripe and a thick black bold eye stripe. Throat and chin white, breast and flanks buff colored with distinctive crimson colored vent. The upper parts are green in color with a beautiful blue colored tail. It has been suggested that the width of the coronal stripe may differ in sexes, though both sexes look alike. The ordinary movements of these birds are very graceful, and their gestures when excited are most amusing. Sometimes they will stand bolt upright, at others crouch down and in either position they will often expand their wings. With other birds they seem quite harmless, even with much smaller ones, but they are liable to fight savagely amongst themselves.

India Pitta breeds during the south-west monsoon from June to August, with peaks in June in central India, and in July in northern India. The nest of the bird is globular in structure with a circular opening on one side built on the ground or on low branches. It is made up of dry leaves and grasses. The bird lays spherical eggs which are four to five in number. These eggs are lustrous, glossy white with deep red and purple spots. These birds spend much time on ground, hunting for insects amidst the leaf-litter and low herbage and quietly fly into a tree branch if disturbed. There foods are chiefly insects, such as termites, ants, insect larvae, earthworms, small snails, millipedes etc.

This species has a very large range and hence does not approach the thresholds for vulnerable under the range size criterion. Despite the fact that the population trend of India Pitta appears to be decreasing, but the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion and for these reasons the species is evaluated as 'Least Concerned' by IUCN. But, the point of concern is that the Indian Pitta is endemic to our sub-continent. The population is also declining due to deforestation to make way for agriculture and urban development. Not only this, the large number of species caught during migration for consumption which may disturb the population trends of these bird species drastically. Thus proper checks on such activities are necessary for the conservation of Indian Pitta.

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Published by:

Tropical Forest Research Institute
(Indian Council of Forestry Research & Education)
(An autonomous council under Ministry of Environmnet, Forests and Climate Change)
P.O. RFRC, Mandla Road
Jabalpur – 482021 M.P. India
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